14. (Amended) The system of claims 2, wherein said second domain at least partially comprises void space formed by at least partial removal of the polymeric species not containing a sufficient quantity of inorganic species to be capable of forming a ceramic oxide from the periodic structure.

15. (Amended) The system of claim 14, wherein said first domain includes an inorganic oxide ceramic formed by oxidation of the polymeric species containing an inorganic species.

16. (Amended) The system of claim 1, wherein said polymeric species containing an inorganic species capable of forming a ceramic oxide is comprised of a polymerized monomer, the monomer containing an inorganic species capable of forming a ceramic oxide.

17. (Amended) The system of claim 2, wherein the first and second domains of the polymeric article comprise a block copolymeric species having at least two blocks A and B that are assembled into the first and second domains respectively.

18. (Amended) The system of claim 17, wherein the block copolymeric species has at least three blocks A, B, and C.

19. (Amended) The system of claim 2, wherein at least one domain further contains an auxiliary component.

20. (Amended) The system of claim 19, wherein said auxiliary component modifies the volume fraction of the domain in which it is present.

21. (Amended) The system of claim 20, wherein said auxiliary component is a homopolymeric species.

22. (Amended) The system of claim 19, wherein said auxiliary component is a particulate.

23. (Amended) The system of claim 1, wherein said polymeric species has a glass transition temperature of at least about 0 degrees C.

24. (Amended) The system of claim 1, wherein the polymeric species comprise polymers having an average molecular weight of at least about 30,000 Da.

25. (Amended) The system of claim 2, wherein the polymeric species comprise polymers having a polydispersity of no more than two.

26. (Amended) The system of claim 3, wherein said second domain is subsequently at least partially filled with a material that cannot be formed into a periodic structure by self-assembly.

27. (Amended) The system of claim 3, wherein said void space is made electrically conducting, thus creating a conducting network.

28. (Amended) The system of claim 3, wherein the article has at least a first side and a second side with at least one void space providing a continuous pathway for fluid communication between said first side and said second side so that the article functions as a membrane.

29. (Amended) The method of claim 7, comprising allowing the block copolymeric species to self-assemble into the phase separated polymeric multi-domain periodic structure.

31. (Amended) The article of claim 30, wherein the article has an at least three-dimensionally periodic structure.

32. (Amended) The article of claim 30, wherein said material is a polymer that cannot be formed into a periodic structure by self-assembly.

33. (Amended) The article of claim 32, wherein said polymer that cannot be formed into a periodic structure by self-assembly is a fluorine-containing polymer.

34. (Amended) The article of claim 33, wherein said polymer that cannot be formed into a periodic structure by self-assembly is poly(tetrafluoroethylene).

35. (Amended) The article of claim 30, wherein said material is a conducting polymer.

36. (Amended) The article of claim 30, wherein said material is a metal.

37. (Amended) The article of claim 36, wherein said metal is a liquid having a melting temperature of at least about 400 degrees C.

38. (Amended) The article of claim 30, wherein said material is a material having a dielectric constant greater than three.

39. (Amended) The article of claim 30, wherein said material is a magnetic material.

40. (Amended) The article of claim 39, wherein said magnetic material is disposed on the surface of a substrate.

41. (Amended) The system of claim 2, wherein the structure has a photonic band gap in at least one direction for electromagnetic radiation of at least one wavelength within the range of about 20 nm to about 1 μm.

42. (Amended) The article of claim 30, wherein the article has an at least one-dimensionally periodic structure.

43. (Amended) The article of claim 30, wherein the article has an at least two-dimensionally periodic structure.

49. (Amended) The mold of claim 47, wherein said void spaces have a characteristic minimum dimension of between 1 nm and 1 μm.

52. (Amended) The mold of claim 47, wherein said inorganic oxide ceramic is comprised of an oxidized silicon-containing polymeric species.

55. (Amended) The membrane of claim 46, wherein the structure is one-dimensionally periodic.

56. (Amended) The membrane of claim 46, wherein the structure is two-dimensionally periodic.

57. (Amended) The membrane of claim 56, wherein said void spaces are in the shape of essentially circular cylinders.

58. (Amended) The membrane of claim 57, wherein said void spaces are non-overlapping and non-intersecting.

59. (Amended) The mold of claim 47, wherein the structure is three-dimensionally periodic.

60. (Amended) The mold of claim 59, wherein said void spaces form an interconnected continuous network of pathways within said structure having a plurality of nodes.

61. (Amended) The mold of claim 60, wherein said void spaces are made conducting, thus forming a conducting network.

81. (Amended) The method of claim 69, wherein the removing step includes exposing the article to a chemical oxidizer.

85. (Amended) The method of claim 69, wherein the removing step includes exposing the article to radiation.

87. (Amended) The method of claim 69, wherein the removing step includes exposing the article to oxygen plasma etching.

89. (Amended) The method of claim 69, wherein the removing step includes exposing the article to a combination of a chemical oxidizer and radiation.

90. (Amended) The method of claim 69, wherein the removing step includes exposing the article to a combination of a chemical oxidizer and oxygen plasma etching.

91. (Amended) The method of claim 69, wherein the removing step includes exposing the article to a combination of a radiation and oxygen plasma etching.

92. (Amended) The method of claim 69, wherein the removing step includes exposing the article to an electron beam.

93. (Amended) The method of claim 69, wherein the removing step includes exposing the article to heat.

94. (Amended) The method of claim 69, wherein the removing step includes exposing the article to a base.

95. (Amended) The method of claim 69, wherein the removing step includes exposing the article to a solvent.

96. (Amended) The method of claim 69, wherein the oxidizing step includes exposing the article to a chemical oxidizer.

100. (Amended) The method of claim 69, wherein the oxidizing step includes exposing the article to radiation.

102. (Amended) The method of claims 69, wherein the oxidizing step includes exposing the article to oxygen plasma etching.

104. (Amended) The method of claim 69, wherein the oxidizing step includes exposing the article to a combination of a chemical oxidizer and radiation.

105. (Amended) The method of claim 69, wherein the oxidizing step includes exposing the article to a combination of a chemical oxidizer and oxygen plasma etching.

106. (Amended) The method of claim 69, wherein the oxidizing step includes exposing the article to a combination of a radiation and oxygen plasma etching.

113. (Amended) The method of claim 110, further comprising before the adding step:

at least partially oxidizing the structure to form an inorganic oxide.

114. (Amended) The method of claim 111, further comprising:

removing the article from the substrate, while leaving behind on the substrate at least a portion of the magnetic material.

115. (Amended) The method of claim 111, wherein the forming step comprises:

providing the substrate;

coating the substrate with a polymeric layer; and

converting the layer into said polymeric article.

116. (Amended) The method of claim 111, wherein the forming step comprises:

providing the substrate; and

attaching said polymeric article to the substrate.

117. (Amended) The method of claim 110, wherein at least one domain of the polymeric article is at least partially oxidized during the removing step.

119. (Amended) The method of claim 110, wherein the polymeric article has an at least one-dimensionally periodic structure.

120. (Amended) The method of claim 111, wherein the polymeric article has an at least two-dimensionally periodic structure.

121. (Amended) The method of claim 110, wherein the polymeric article has a three-dimensionally periodic structure.

122. (Amended) The method of claim 110, wherein domains that are at least partially removed during the removing step are non-interconnected.

123. (Amended) The method of claim 111, wherein during the adding step, the magnetic material is deposited into the void space by electrodeposition.

125. (Amended) The method of claim 110, wherein during the adding step, the magnetic material is deposited into the void space by vapor deposition.

135. (Amended) The article of claim 134, wherein the at least one domain including a magnetic material is at least partially surrounded by void space.

136. (Amended) The article of claim 134, wherein the at least one domain including a magnetic material is at least partially surrounded by a polymeric material.

137. (Amended) The article of claim 134, wherein the at least one domain including a magnetic material is at least partially surrounded by an inorganic oxide ceramic.

138. (Amended) The article of claim 134, further comprising a substrate in contact with a surface of the at least one domain including a magnetic material.

140. (Amended) The article of claim 134, wherein the at least one domain including a magnetic material has a characteristic dimension between about 10 nm and about 50 nm.

141. (Amended) The article of claim 134, wherein domains including a magnetic material are separated from each other by a minimum distance of between about 1 nm and about 20 nm.

142. (Amended) The article of claim 134, wherein the at least one domain including a magnetic material consists essentially of the magnetic material.

143. (Amended) The article of claim 134, wherein the magnetic material is selected from at least one of cobalt, nickel, iron, alloys of cobalt and platinum, alloys of cobalt and iron, oxides thereof, and barium ferrite.